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A Study of the Impact of Corporate Digitization on Corporate Equity Structure

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Abstract: *In the context of digital economy, enterprise digitalization brings new research concepts and mechanisms to corporate governance. How does corporate digitalization affect the change of corporate equity structure? Based on the data of Chinese A-share listed companies from 2012 to 2021, this paper investigates the intrinsic mechanism of corporate digitization affecting corporate shareholding structure from the theoretical level and constructs the index of the degree of corporate digitization, on the basis of which, the impact of corporate digitization on the shareholding structure is examined from the empirical point of view. It is found that the higher the degree of enterprise digitization, the lower the equity concentration, and the path analysis shows that enterprise digitization reduces the equity concentration by improving enterprise performance and internal control role. This study has certain reference value to promote the development of enterprise digital economy, improve the equity structure, and enhance the efficiency of corporate governance.*

Keywords: *enterprise digitalization, equity structure, corporate performance, internal control role*

1. Introduction

Corporate governance is an important part of the modernization of national governance system and governance capacity, an effective way to implement China's macro-political system into micro-corporate governance, and an important foundation and guarantee for cultivating world-class enterprises. The arrival of the information age has led to the flourishing of the digital economy, and the issue of corporate governance has ushered in new opportunities and challenges. The white paper "Joining hands to build a community of destiny in cyberspace" released by the State Council on November 7, 2022, pointed out that as of 2021, the scale of China's digital economy had reached 45.5 trillion yuan, accounting for 39.8% of GDP, and that the digital economy had become one of the main engines driving economic growth. Accelerating the digital transformation of industries and realizing high-quality development of enterprises is imminent.

The digital economy includes both digital industrialization and industrial digitization. Through digital industrialization, the data created in the production process of key technologies become production factors, thus providing new services and applications; through industrial digitization, it promotes the digital transformation of traditional enterprises and key industries, so as to continue to use digital technology to transform and empower the three industries [1]. The role of digital economization in promoting economic development is reflected in the industry and enterprise levels. At the industrial level, digital economization plays a role in promoting cross-border integration, improving industrial efficiency, reconfiguring the competition model, and empowering industrial upgrading.

At the enterprise level, digital economization not only affects the production and operation process and performance of procurement, production and sales, but also influences the corporate governance of enterprises. Equity structure, as the property right foundation of the governance system of listed companies, not only determines the composition and operation of the internal governance institutions of listed companies, and acts on the efficiency of the whole corporate governance through the internal governance institutions [2]. And it directly affects the development and future of the company. However, few studies have discussed the issue of corporate equity in the digital economy. In this paper, we explore the impact of corporate digitalization on corporate equity structure from the corporate level and analyze the path from three aspects. It helps to enrich the related theories of enterprise digitalization and equity structure, and provides useful references for promoting the development of enterprise digital economy, improving enterprise equity structure, and enhancing the efficiency of

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corporate governance.

2. Literature Review and Research Hypotheses

Corporate governance has gone through the classical enterprise system to the modern enterprise system, and most of the existing studies are based on the modern enterprise system. The goal of corporate governance has also evolved from ensuring the maximization of shareholders' interests to ensuring the maximization of stakeholders' interests. As a result, corporate governance models have evolved into three main types: the externally monitored Anglo-American model with a relatively decentralized shareholding structure; the internally monitored German-Japanese model and the family-governed Southeast Asian model with a relatively centralized shareholding structure. In the equity structure, it is generally categorized into absolute holding, relative concentration, and high dispersion. Regarding the influencing factors of enterprise equity structure, the comprehensive previous views can be divided into two major aspects of the enterprise's own mechanism and national reform to study and analyze; the enterprise's own aspects include the enterprise strategy [3], enterprise value [4] and so on. National reform aspects include the nature of enterprise ownership [5].

With the development of computer technology, the popularization of the Internet, and the evolution of mobile terminals, mankind has entered the digital era, which has brought positive impacts to the state, enterprises, and individuals; on the one hand, the digital economy and digitalization promote the high-quality development of the city, and enhance entrepreneurial activity [6] and stock liquidity [7]. On the other hand, existing research focuses on analyzing the impact of the degree of enterprise digitization on enterprise performance [8], innovation performance [9], corporate governance [10], etc., and finds that as the degree of enterprise digitization improves, the level of corporate governance, enterprise performance, innovation performance, etc. can be significantly improved. For example, Qi Huaijin et al. found that the digital economy improves the level of corporate governance under the perspective of information asymmetry and irrational behavior of managers [10]. Then, the impact of digital economy on corporate governance will inevitably also have a profound impact on the changes of corporate equity structure. Currently, fewer studies have revealed the impact of the degree of corporate digitization on the changes in corporate equity structure, resulting in unclear pathways for the impact of the degree of corporate digitization on corporate governance structure.

Therefore, the focus of this paper is to explore the impact of the degree of corporate digitization on corporate equity structure. In addition, in order to better understand the relationship between the degree of enterprise digitization and enterprise equity structure, it is combined with the fact that the equity structure of an enterprise is usually directly related to technological change, the institutional environment and the enterprise's own characteristics. Technological change and institutional environment are the external dynamics of the evolution of the firm's equity structure, and the firm's own characteristics are the internal dynamics of the evolution of the firm's equity structure. In this study, we select corporate performance and the role of internal control as mediating variables to analyze the influence mechanism of corporate digitalization on corporate equity structure.

2.1 Degree of enterprise digitization and enterprise equity structure

At this stage, due to the development of emerging technologies such as the digital economy, a new trend has emerged in China: equity decentralization. In the current environment, corporate governance objectives and focus have changed, so the positive significance of equity structure decentralization is increasing. Smick believes that enterprise digitalization not only promotes the transformation of corporate governance structure, but also enriches and expands corporate governance mechanisms and paths [11]. Mobile Internet technology and big data technology unceasingly inject large volume, high dimensionality and wide coverage of data resources into the market [12], which not only improves the quality and accuracy of traditional structured data, but also contributes a large amount of unstructured data with great development potential [13]. At the same time, digital technologies such as artificial intelligence, blockchain, and self-media have greatly contributed to the flattening of the equity structure and the construction of a full-circulation information environment. Enterprise digitization has changed the business model, product performance, business processes, etc., and enterprises have been comprehensively upgraded and transformed, which has led to the reassessment of enterprise value [4]. On the one hand, this change in value attracts new investors and causes existing shareholders to re-examine the future prospects of the company, thus affecting their shareholding decisions and further influencing the shareholding structure. On the other hand, the digitalization process of a company

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requires significant investment costs, including in technological innovation, market expansion, and talent training. It further affects the company's capital flow, ways and channels to raise capital, forcing the equity structure to be adjusted. Based on the above analysis, it is proposed:

Hypothesis 1: The higher the degree of enterprise digitization, the lower the enterprise equity concentration.

2.2 The mediating role of firm performance

The transformational path of digitalization has enabled companies to go beyond a one-dimensional growth model and win greater scope for development in terms of value creation and acquisition by changing the value proposition and business logic [4]. In the process of production and life, enterprise digitization has changed the company's mode of operation, the mode of handling business, and the process of customer experience through the adoption of digital technology, which has touched all areas of the enterprise, thus leading to top-down adjustments in the enterprise. Firstly, digital enterprises not only provide smarter, more flexible, faster and secure products and services, but also optimize business processes, improve efficiency and reduce costs. Second, it strengthens innovation momentum at the level of productivity, thus enhancing enterprise performance. Enterprise digital transformation, as a cutting-edge transformation mode in the new era, can also fully empower corporate innovation activities, especially in terms of the important technological directions represented by 5G, artificial intelligence and the Internet of Things.

Corporate performance and equity structure complement each other, on the one hand, corporate performance promotes the adjustment of equity structure, on the other hand, it can provide reliable information data for the dynamic adjustment of equity structure. Equity structure determines the control of the company and the way of benefit distribution. Corporate performance, on the other hand, is a judgment of the operating efficiency and performance of the operator of the company during a certain period of operation. When the enterprise performance is good, it means that the company's development strategy, management level and market competitiveness are all to the good. Thus, it attracts more investors and capital to enter the enterprise, increases the company's equity size, and changes the original shareholding structure. When the enterprise has good performance, it can continue to review the current equity structure to achieve better benefits in order to realize high-quality development. Based on the above analysis, the following hypotheses are proposed:

Hypothesis 2: The higher the degree of digitization of the enterprise, the better the performance of the enterprise and thus the lower the equity concentration.

2.3 The mediating role of internal control

Internal control is an important governance mechanism including control environment, risk assessment, activity control, information communication and supervision [14]. On the one hand, enterprise digitalization has gradually become an important method for enterprises to improve the quality of control and optimize the control system. The in-depth integration of digital technology with the internal and external control and operation systems of enterprises can ensure the effective implementation of control activities, and play a mitigating and reinforcing role in the internal supervision mechanism [15], which in turn improves the quality of the internal control of enterprises. On the other hand, in the process of enterprise digital transformation, digital technology and traditional industries are deeply combined to bring subversive innovation to the enterprise operation and management mode, which makes the internal control of the enterprise suffer a huge impact, prompting the internal control of the enterprise to produce the whole element, the whole process, and the whole system of change, which has a far-reaching impact on the quality of the internal control of the enterprise [16].

Internal control helps to improve the efficiency of corporate governance. An effective internal control system can ensure the smooth channels of internal management and standardize the company's decision-making process, which helps shareholders accurately and effectively understand the company's operating conditions and financial status, so as to make more informed investment decisions, thus improving the efficiency of corporate governance, and further affecting the stability and reasonableness of the shareholding structure. In addition, internal control also helps to protect shareholders' rights and interests, through the establishment of a sound internal control system, the company strengthens the supervision and restraint of the management's behavior, prevents the abuse of authority and damage to the interests of shareholders, as well as ensures the authenticity and accuracy

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of the company's financial reports, prevents financial fraud and protects the legitimate rights and interests of shareholders. This enhances shareholders' trust in the company and promotes the stability of the shareholding structure. In addition, through the internal control system to regulate and manage the company's business processes, the company can more effectively achieve its strategic objectives and improve the efficiency and quality of its business operations. This helps to enhance the company's market competitiveness and profitability, thus attracting more investors' attention and investment, and further affecting the composition and changes of the equity structure.

Therefore, this paper proposes the following hypotheses.

Hypothesis 3: The higher the degree of digitalization of a firm, the stronger the quality of internal control and thus the lower the equity concentration.

3. Research Design

3.1 Sample Selection and Data Source

This paper selects A-share listed companies in Shanghai and Shenzhen from 2012-2021 as the research object. The data of corporate equity structure are obtained from CSMAR database, including the proportion of the first largest shareholder and the proportion of the top three shareholders. At the same time, we have done the following treatment to the samples: exclude the financial industry and the samples with missing data. The final 4486 listed companies, a total of 21777 observations. And Winsorize the continuous variables related to the model at 1% and 99% level.

3.2 Model Setting and Variable Definition

This paper examines the impact of corporate digitalization on corporate equity structure through the following model:

$$FSP_{it} = \alpha_0 + \alpha_1 DI_{it} + \beta_1 \sum Control_{it} + \sum Year + \sum Industry + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \alpha_0 + \alpha_1 DI_{it} + \beta_1 \sum Control_{it} + \sum Year + \sum Industry + \varepsilon_{it} \quad (2)$$

$$ICQ_{it} = \alpha_0 + \alpha_1 DI_{it} + \beta_1 \sum Control_{it} + \sum Year + \sum Industry + \varepsilon_{it} \quad (3)$$

Where, model (1) FSP represents the enterprise equity concentration; represents the constant term, and represents the regression coefficient, DI represents the degree of enterprise digitization, Control represents the control variable, and ε represents the residual term.All the variables in the model are listed in Table 1

Table 1: Definition of variables

Variable Symbol	Variable Description
Layer	Shareholding Concentration
DI	The logarithm of the frequency of the feature words in the company's annual report is added to one.
ON	If it is a private company, the value will be 1, if it is a state-owned company, the value will be 0.
ROE	Net Profit/Net Assets
ICQ	Natural logarithm of Dibor's internal control index
Board	Total number of board members
Indep	Number of independent directors/number of board members
Age	Since inception
LEV	Total Liabilities / Total Assets
Cash	Net cash flow from operating activities / Total assets
Ind	Industry Dummy Variables
Year	Yearly Dummy Variables

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3.2.1 Explanatory variables

The explanatory variables are the proxy variables of equity structure. Chinese scholars generally use equity concentration (shareholding ratio and Herfindel index, etc.) and the nature of equity (the proportion of state-owned shares and the proportion of legal person shares), some scholars also use the proportion of outstanding shares and the proportion of shares held by the management, and in this paper, we use equity concentration to measure the equity structure.

3.2.2 Core explanatory variables

Enterprise digitization: the number of words involving “enterprise digital transformation” in the annual reports of listed companies is used to measure the degree of enterprise digitization. Based on the five dimensions of artificial intelligence technology, big data technology, blockchain technology, cloud computing technology, and digital technology application, we obtain the number of keywords related to enterprise digitization from the annual reports of listed companies, and then measure the degree of enterprise digitization with the final total number of word frequencies. The specific word frequencies of the five dimensions are consistent with the existing studies[7] and will not be repeated in this paper. Because the data has the characteristics of “right skewed”, and the data include 0, so the total word frequency is added 1 and then take the logarithmic processing.

3.2.3 Mediating variables

This paper selects the following two variables as mediating variables. Enterprise performance; this paper measures the ratio of net profit and net assets of the enterprise. Internal control; this paper measures the role of internal control by taking the natural logarithm of Dibble internal control index.

3.2.4 Control Variables

The following variables are selected for control in this paper: 1 Board size: measured using the total number of board members; 2. Cash flow (CF): measured using the ratio of net cash flow from operating activities to total assets; 3 Proportion of independent directors: the ratio of the number of independent directors to the number of directors; 4 Balance Sheet Ratio: the ratio of total liabilities to total assets; 5 Industry; 6 Year; and 7 Age of the firm: the company's inception to date.

4. Empirical results and analysis

4.1 Descriptive statistics

Table 2 shows the descriptive statistics of each variable. The explanatory variable corporate shareholding structure (FSP) has a mean value of 0.485, a standard deviation of 0.157, a maximum value of 0.983, and a minimum value of 0.0564, which indicates that there is a certain level of disparity in shareholding concentration among different enterprises. The explanatory variable enterprise digitization degree (Digital1) has a mean value of 1.418, a standard deviation of 1.400, a maximum value of 5.081, and a minimum value of 0. The overall enterprise digitization degree is low, and there is a large difference in the digitization degree of different enterprises. The mean value of Internal Control Role (ICQ) is 6.480, the standard deviation is 0.141, the maximum value is 6.738, and the minimum value is 5.729. The mean value of Corporate Performance is 0.0384, the standard deviation is 0.0637, the maximum value is 0.206, and the minimum value is -0.365.

Table 2: Descriptive statistics

Variable	N	Mean	Min	Max	SD
FSP	21777	0.485	0.0564	0.983	0.157
DI	21777	1.418	0	5.081	1.400
Size	21777	22.36	19.95	26.43	1.323
ROA	21777	0.0384	-0.365	0.206	0.0637
ICQ	21777	6.480	5.729	6.738	0.141
Board	21777	8.523	5	14	1.628
Indep	21777	0.377	0.333	0.571	0.0542
AGE	21777	2.868	1.749	3.499	0.345
Cash	21777	0.0481	-0.166	0.245	0.0674
LEV	21777	0.430	0.0583	0.960	0.202

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4.2 Correlation analysis

The results of correlation analysis of the main variables in this paper are shown in Table 3. As shown in Table 3, the results of Pearson correlation coefficient indicate that the correlation between FSP and DI is in line with expectations. In addition, the coefficients between the variables are less than 0.6, which initially indicates that there is no problem of covariance among the variables.

Table 3: Correlation analysis

	FSP	DI	ICQ	ROA	BOARD	INDEP	AGE	CASH	LEV
FSP	1								
DI	-0.095***	1							
ICQ	0.162***	-0.007***	1						
ROA	0.177***	-0.013***	0.359***	1					
BOARD	0.022***	-0.001***	0.066***	0.013*	1				
INDEP	0.049***	0.063***	0.001	-0.018***	-0.512***	1			
AGE	-0.146***	0.059***	-0.102***	-0.080***	0.047***	-0.030***	1		
CASH	0.126***	-0.016**	0.122***	0.376***	0.035***	0.002	0.018***	1	
LEV	0.182***	-0.067***	-0.026***	-0.323***	0.146***	-0.002	0.182***	-0.165***	1

4.3 Benchmark regression

The results of the main test of this paper are presented in Table 4. the regression coefficient of digital transformation and corporate equity concentration is -0.0048 and passes the significance test at 1% level, indicating that the higher the degree of digital transformation is the lower the equity concentration, i.e. the research hypothesis H1 is valid.

Table 4: Benchmarking

	e2	e4
VARIABLES	FSP	FSP
DI	-0.005***	-0.004***
BOARD	-0.003***	-0.004***
INDEP	-0.027*	-0.044*
AGE	-0.112***	-0.154***
CASH	0.011	0.002
LEV	-0.008*	-0.010
Constant	0.707***	0.817***
Number of id	2,854	2,854

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4.4 Mediating effect

This paper draws on the mediation effect model of Jiang Ting [17] to test the mediation effect played by corporate performance, internal control in corporate digitalization and equity structure.

Firstly, we test that enterprise digitalization can positively and significantly affect enterprise performance, and the results of the test are shown in Table 5.

Table 5: Mediating effects test

	e1	e3
VARIABLES	ICQ	ROA
DI	0.005***	0.002***
BOARD	0.003	0.000
INDEP	0.037	-0.025
AGE	-0.030	0.011
CASH	0.135***	0.180***
LEV	-0.073***	-0.139***
Constant	6.611***	0.088***
Observations	21,777	21,777
R-squared	0.066	0.143
Number of id	2,854	2,854

Secondly, based on the existing literature and theories to demonstrate the causal relationship between corporate performance and corporate equity concentration, the analysis of previous studies shows that the conclusions of the relationship between corporate performance and equity concentration are more or less the same. Taking listed companies as research samples, Li Xiaoqing et al. illustrated that the richer the equity diversity and the higher the equity checks and balances, the better the innovation performance, and the higher the equity concentration, the worse the innovation performance; the proportion of executive-type directors in the board of directors weakened the promotional effect of the equity diversity on the innovation performance, and strengthened the inhibitory effect of the equity concentration on the innovation performance [18]. Peng Yong takes the sample of GEM listed enterprises in Shenzhen City as a sample to illustrate the significant negative correlation between equity concentration and enterprise performance [19]. From the research theme of the article, corporate performance is the backbone of an enterprise's operation, which deeply influences the equity structure in order to make high-quality development of the enterprise.

Then based on the existing literature and theories to demonstrate the causal relationship between internal control and corporate equity concentration. In general, equity concentration makes the firm lose the principle of checks and balances and restricts the role of internal control. The important objective of internal control is to improve the organizational effectiveness as well as operational efficiency and effectiveness of the firm. The higher the quality of internal control, the higher the degree of equity checks and balances and the more decentralized the equity concentration. The relationship between equity structure (equity concentration, equity checks and balances) and the quality of internal control, Zhang Xianzhi et al. studied the relationship between equity structure and internal control through a questionnaire, and came up with the empirical results that equity concentration negatively affects internal control [20]. In this way, they obtained that the higher the quality of internal control, the more decentralized the shareholding structure, i.e., the lower the shareholding concentration.

Table 5 shows the mediating role played by enterprise performance and internal control, as shown in column (1), the regression coefficient of enterprise digitization and the role of internal control is 0.005, which is significant at the 1% level. From column (3), the regression coefficient of enterprise digitization and enterprise performance is 0.002, which is significant at 1% level, indicating that

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enterprise digitization can improve enterprise performance. Based on the argumentation of the previous research hypotheses, it indicates that digital transformation can enhance corporate performance and internal control, which further dilutes equity. Research hypothesis 2 and research hypothesis 3 are verified.

4.5 Endogeneity test (lagged one period and lagged two periods)

In this paper, the explanatory variable enterprise digitization is treated as lagged one period and lagged two periods, and then the model is regressed again, and the results are shown in columns (1) and (2) of Table 6. As shown in column (1), the regression coefficient of enterprise digitization and equity concentration is -0.005 after replacing it with lagged one-period digital transformation and passes the test of significance at the 1% level, and the regression coefficient of enterprise digitization and equity concentration is -0.005 after replacing it with lagged two-period digital transformation, which is significant at the 1% level, which further confirms the research hypothesis H1 and indicates that this paper's regression results are robust.

Table 6: Endogeneity test

	e2	e4
VARIABLES	FSP	FSP
BOARD	-0.004***	-0.003***
INDEP	-0.043	-0.028
AGE	-0.157***	-0.153***
CASH	0.006	0.003
LEV	-0.002	0.006
Constant	0.831***	0.810***
Observations	18,621	16,011
Number of id	2,636	2,493

4.6 Robustness test (replacing equity concentration as the sum of the proportion of the top three shareholders)

The results of the regression analysis are shown in column (1) of Table 7, using the sum of the top three shareholders' shareholdings as the explanatory variable. The coefficient of enterprise digitization and equity concentration is -0.004, which is significant at 1% level, further proving that hypothesis 1 of this paper is valid.

Table 7: Replacement of explanatory variables

	e1	e2
VARIABLES	FSP1	FSP1
DI	-0.004***	-0.003***
	(0.001)	(0.001)
BOARD		0.002
INDEP		-0.048*
AGE		-0.293***
LEV		-0.063***

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5. Conclusion and Implications

This paper aims to study the mechanism between enterprise digitization and equity structure, and analyzes the influence mechanism of enterprise digitization degree on enterprise equity structure with enterprise performance and internal control level as mediating variables. Finally, it is concluded that enterprise digitalization makes the equity structure flat, enterprise performance, internal control role does play a mediating role, the degree of digitalization by reducing information asymmetry and improve enterprise performance and enterprise internal control level, and then reduce the concentration of enterprise equity structure.

The conclusion of this paper affirms the optimizing effect of digital transformation on corporate equity structure. Enterprises should promote the digitalization process in order to achieve the second 100-year goal. Moreover, they should pay high attention to internal control and corporate information transparency, and establish a comprehensive evaluation system of internal control in order to promote the continuous optimization of internal control on equity structure. Relying on the opportunities brought by digital technology and facing new technologies and concepts, etc., we will do a good job of combining internal and external resources to continuously optimize the corporate governance structure, so as to create greater benefits for the enterprise itself as well as society.

At the level of policy formulation, firstly, accelerate the construction of digital infrastructure, cultivate digital industry bodies and digital service platforms, and provide a strong guarantee for accelerating the digital transformation of enterprises and optimizing the enterprise equity structure. Second, accelerate the establishment of data sharing mechanisms to improve social information transparency. Establish a data sharing incentive mechanism, encourage information sharing among enterprises, explore collaborative governance models among government, enterprises and society, promote transparent opening of enterprise data to the public, and form a data-sharing society. The development and utilization of information resources and the improvement of economic information transparency cannot be separated from the improvement and implementation of laws and regulations related to information security, which requires the Government to provide an institutional environment and basic protection for the construction of information transparency in society.

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